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| 10/796,146  | 03/10/2004  | Mizuhisa Nihei       | 040102              | 2043             |
| 23850 7590 07/29/2008<br>KRATZ, QUINTOS & HANSON, LLP<br>1420 K Street, N.W.<br>Suite 400<br>WASHINGTON, DC 20005 |             |                      |                     |                  |
| EXAMINER  |             |                      |                     |                  |
| PHAM, THANHHA S   |             |                      |                     |                  |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/796,146

**Applicant(s)**

NIHEI ET AL.

**Examiner**

Thanhha Pham

**Art Unit**

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 14 April 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-17 and 21-29 is/are pending in the application.
- 4a) Of the above claim(s) 11-17 and 21-29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 7-10 is/are rejected.
- 7) ☒ Claim(s) 2-6 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/S508)  
Paper No(s)/Mail Date 3/5/2008.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application.
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

This Office Action is in response to Applicant Amendment dated 4/14/2008.

### ***Claim Rejections - 35 USC § 112***

**1. Claims 7-10 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.**

► With respect to claims 7 and 10,

Limitation of "a SiC substrate having ...the first upper surface being opposed to the second upper surface" is not supported by specification and figures.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

**2. Claims 7-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.**

► With respect to claim 7,

lines 2-3, the limitation "a first and a second upper surface, the first upper surface being opposed to the second upper surface" renders the claim indefinite.

It is not clear what "a first and a second upper surface" means. In addition, it is not clear how "the first upper surface" can be opposed to "the second upper surface"

► With respect to claim 10,

lines 2-3, the limitation "a first and a second upper surface, the first upper surface being opposed to the second upper surface" renders the claim indefinite. It is not clear what "a first and a second upper surface" means. In addition, it is not clear how "the first upper surface" can be opposed to "the second upper surface"

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**1. Claims 1, 7, 8 and 10, as being best understood, are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Chen [US 6,191,478].**

► With respect to claim 1, Chen (fig 5 & 8, cols 1-8) discloses the claimed semiconductor device comprising:

a SiC substrate (25, silicon carbide, col 5 lines 15-21); and

a heat conductor (33, col 5 lines 4-38) formed in a first hole (27) in the SiC substrate and made of bundle of carbon nanotubes (carbon fiber) inherently oriented in a depth direction of the first hole,

wherein a diameter of the heat conductor is the same as a diameter of the first hole.

► With respect to claim 7, Chen (fig 5, 7 & 8, cols 1-8) discloses the claimed semiconductor device comprising:

a SiC substrate (25, silicon carbide, col 5 lines 15-21 & col 8 lines 38-55) having a lower first surface and an upper second surface, the lower first surface being opposed to the upper second surface;

a first heat conductor (33a, col 5 lines 4-38) formed in a first hole (27a, col 8 lines 38-55) in the lower first surface of the SiC substrate and made of bundle carbon nanotubes (carbon fiber is a bundle of carbon nanotube);

a second heat conductor (33b, col 5 lines 4-38) formed in a second hole (27b) in the lower first surface of the SiC substrate to be spaced apart from the first hole in an interval, the second heat conductor being made of bundle carbon nanotubes (carbon fiber) inherently oriented in a depth direction of the second hole; and

an element (61, fig 7) on the upper second surface of the SiC substrate,  
wherein a diameter of the first heat conductor is the same as a diameter of the first hole and a diameter of the second heat conductor is the same as a diameter of the second hole.

► With respect to claim 8, the claimed distance from the upper second surface of the SiC substrate to an upper surface of the second heat conductor relative (longer) to a distance from the upper second surface of the SiC substrate to an upper surface of the first heat conductor would have been obvious to an ordinary artisan practicing the invention because, absent evidence of disclosure of criticality for the range giving unexpected results, it is not inventive to discover optimal or workable ranges by routine experimentation. In re Aller, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). Furthermore, it appears that these changes produce no functional differences and therefore would have been obvious. See In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

► With respect to claim 10, Chen (fig 5, 7 & 8, cols 1-8) discloses the claimed semiconductor device comprising:

a SiC substrate (25, silicon carbide, col 5 lines 15-21) having a lower first upper surface (the surface of the substrate 25 that defines hole 27b -- wall and "bottom" of hole 27b) and a upper second surface, the lower first surface being opposed to the upper second surface;

a first heat conductor (33a, col 5 lines 4-38) formed in a hole (27a, col 8 lines 38-55) in the SiC substrate and made of bundle of carbon nanotubes (carbon fiber) inherently oriented in a depth direction of the hole (carbon fibers in the hole 27a would oriented in a depth direction of the hole and is a bundle of carbon nanotubes) ;

a second heat conductor (33b, col 5 lines 4-38) formed to cover the upper first surface of the SiC substrate entirely (*second heat conductor 33b filling hole 27b would inherently*

*entirely cover the first surface since the lower first surface of the substrate 25 is the surface that define the hole 27b) and made of bundle of carbon nanotubes (carbon fiber) inherently oriented in a depth direction of the first hole (carbon fiber -- bundle of carbon nanotubes -- oriented in a depth direction of the first hole 27b); and*

an element (61, fig 5) formed on the upper second surface of the SiC substrate, wherein a diameter of the first heat conductor is the same as a diameter of the hole.

#### ***Allowable Subject Matter***

2. Claim 2-6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### ***Response to Arguments***

Applicant's arguments filed 4/14/2008 have been fully considered but they are not persuasive.

In regard to Applicant argument that "carbon fiber" is distinguished over "bundle of carbon nanotubes", the argument not persuasive since carbon fiber is the same as bundle of carbon nanotubes -- see Brandes et al (US 6,445,006) as an evidence that shows "carbon fiber" and "bundle of carbon nanotubes" are interchangeable terms that has been used in the art to describe material of carbon nanotubes.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanhha Pham whose telephone number is (571) 272-1696. The examiner can normally be reached on Monday and Thursday 9:00AM - 9:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on (571) 272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for



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published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Thanhha Pham/

Primary Examiner, Art Unit 2813